FOREST PRACTICES, SILVICULTURAL PRESCRIPTIONS, AND THE WESTERN SPRUCE BUDWORM

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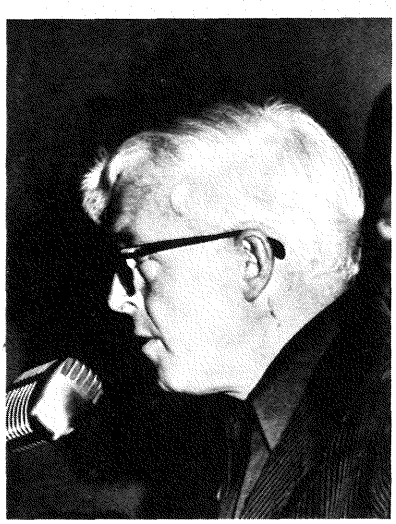

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I appreciate the invitation by Dr. Batzer and Dr. McKnight to discuss forest practices, silvicultural methods, and the western spruce budworm, *Choristoneura occidentalis* Freeman, on this panel concerned with control methodology available or planned for the near future.

I will briefly mention three aspects of the situation: (1) past research in the West, (2) problems and needs of resource managers in the northern Rockies, and (3) research underway in western Montana.

Past Research

I know of only three published papers concerned with forestry practices or stand conditions and the spruce budworm in the West. Following a study of stand condition and spruce budworm damage in a western Montana forest, Fauss and Pierce (1969) concluded that preventing a buildup of budworm populations through silviculture would require either reduction of the Douglas-fir stocking to a very low level or a change in the stand composition to favor pine. On farm woodlots or other land where precommercial thinning is practiced, they indicated that ponderosa pine probably should be

favored over Douglas-fir or should constitute at least 50 percent of the residual stand if the risk of spruce budworm defoliation is to be reduced.

Williams and Shea (1971) discuss two silvicultural practices that could render the forest environment less vulnerable to buildups of budworm populations: (1) reducing the true-fir complement in all budworm-populated stands, and (2) cutting Douglas-fir and burning the cutting units to favor ponderosa pine over all firs. They generally recommend patch clearcutting, with the cutting units kept as small as practicable. In a related study, Williams and others (1971) add a third practice—maintaining a stand of thrifty, rapidly growing trees.

These appear to be sound recommendations that should be tested. However, many of the budworm-infested forests in the northern Rockies are not in the pine-fir type but are considered to be in the larch-fir type, composed essentially of western larch, Douglas-fir, Engelmann spruce, and subalpine fir. Because the western spruce budworm thrives on all of these hosts, some of the current recommendations may not be applicable.

Management Problems

The three most serious resource management problems in areas infested by the western spruce budworm are: failure of many stands to regenerate; lack of seed for regeneration programs; and impacts from growth loss and tree deformity. On some national forests, budworm larvae feeding on seedlings have contributed to regeneration failures in shelterwood and seed-tree cuttings.

In western Montana and northern Idaho, damage to seedlings appears to be more severe in naturally regenerated areas after partial cutting than in clearcuts, particularly in the larger clearcuts. Other cutover areas have not regenerated, either because no cones have been produced on heavily defoliated trees or because cones have been destroyed by budworm larvae. Some national forests have been unable to collect seed from budworm-infested areas since 1967, a fact that may require a change in management plans.[1] These seed shortages make it difficult for forest personnel to collect seed for reforestation according to habitat type and elevational zones. A new Regional directive requires seed to be planted near the site from which it was collected.[2]

[1] Memorandum from the Region 1 Regional Forester, Steve Yurich, to forest supervisors dated May 1, 1973, including minutes of western spruce budworm workshop held in Missoula, Montana, on March 29, 1973.

[2] Memorandum from Jerald Dewey to William Ciesla dated October 18, 1972, concerning an ad hoc spruce budworm committee meeting in St. Maries, Idaho, on October 6, 1972, to evaluate the spruce budworm situation.

Resource managers on several national forests in western Montana and northern Idaho are asking for guidance in managing budworm-infested stands, particularly young stands. In addition to the judicious use of insecticides, managers are interested in the consequences of thinning, the types of cutting—clearcutting, shelterwood, seed tree, etc.—that should be used, the species (if any) that can or should be favored, and so on. A concentrated research effort could provide guidance.

Current Research

The Intermountain Forest and Range Experiment Station has three studies underway that are concerned with the relationships between harvesting practices, silvicultural treatments, or both, and the western spruce budworm.

In 1962 we discovered that budworm larvae actually sever the stems of terminal and lateral shoots of western larch, in addition to feeding on the foliage (Fellin and Schmidt, 1967).

In 1965 a study was designed to determine: (1) the effect of this type of budworm damage on height growth and form of young western larch, and (2) if spacing of the trees has any effect on the amount of intensity of budworm damage to trees.

We found that this budworm larval feeding jeopardizes straight form and rapid juvenile height growth of trees by producing crooked and misshapen trees (Fellin and Schmidt, 1973), resulting in a net loss in height growth of 24 to 30 percent (Schmidt and Fellin, 1973).

We also found that the incidence of budworm damage was not consistently related to stand density. In the first year of the study, when budworm damage was relatively light, the percentage of dominant trees with leader severances was highest in the plots having the fewest trees. However, this relationship was not apparent during the succeeding years as the overall level of budworm damage increased.

A second study was initiated in 1968 to determine if the application of nitrogen, phosphorus, or potassium fertilizers in six different treatment combinations applied to western larch regeneration had any effect on the abundance of, or damage by, spruce budworm larvae.

Measurements were made of fascicles and lateral shoots damaged by budworm larvae in 1968, 1970, and 1972. Data analysis is incomplete, but it appears that in most of the study areas the incidence of damage was greater on trees in fertil-

ized plots than in the controls. Particularly among the fertilized plots, the data indicate there was less damage where nitrogen was not applied. At this time data on larval abundance are not available.

The most elaborate and recent of the three studies is a cooperative effort with the Northern Region of the Forest Service involving a comprehensive study of timber harvesting systems in the northern Rockies. The study is located on the Coram Experimental Forest near Glacier-Waterton International Peace Park in northwestern Montana. Most of the experimental forest is infested with the western spruce budworm.

The study has two basic objectives: (1) evaluate skyline logging systems and intensive timber utilization under shelterwood, group selection, and clearcut silvicultural prescriptions in larch–Douglas-fir stands; and (2) evaluate the biological and environmental effects of harvesting and degree of residue utilization. The latter objective includes influences on revegetation and stand re-establishment; soil, water, and nutrient regimens; insect and disease problems; forest aesthetics; and postharvest management activities and costs.

Within each of the three cutting units, three silvicultural prescriptions will be applied with and without prescribed fire:

1. Cutting and removing all understory, including broad leaves, with no burning.

2. Cutting and leaving all understory, including broad leaves, with burning.

3. Removal of all or part of the merchantable overstory, with minimum damage to the residual understory, and no burning.

The cutting, yarding, and removal of the merchantable and nonmerchantable material from the forest took place during 1974. The prescribed burning will be done in the fall of 1975, followed by the various posttreatment measurements.

This study involves some 28 principal investigators in nine biological and five nonbiological fields. One of the biological studies will evaluate the combined effects of harvesting methods, silvicultural prescriptions (especially fire), and residue treatments on the impact of the western spruce budworm, particularly as the budworm affects newly established stands, residual understory and residual overstory, and production of cones and seeds.

Some of our first pretreatment efforts have been to measure dispersal of second-instar larvae, defoliation, and top kill in undisturbed stands. Following treatments and burning, we will begin to measure the newly regenerating stand, and we will also compare the relative incidence of damage on planted trees with trees developing from direct seeding. We will continue to follow the impacts of the budworm in the study area as the infestation ages.

We believe these research efforts will provide some guidance for resource managers and also will contribute to our continuing effort to coexist with the western spruce budworm in the northern Rocky Mountains.

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